AIC809/AIC810

3-Pin Microprocessor Reset Circuits

FEATURES

- Ultra Low Supply Current 1μA(typ.)
- Guaranteed Reset Valid to Vcc=0.9V
- Available in Three Output Type: Open-Drain Active Low (AIC809N), Push-Pull Active Low (AIC809), Push-Pull Active High (AIC810)
- 140ms Min. Power-On Reset Pulse Width
- Internally Fixed Threshold 2.3V, 2.6V, 2.9V, 3.1V, 4.0V, 4.4V, 4.6V
- Tight Voltage Threshold Tolerance: 1.5%
- Tiny Package in SOT-23

APPLICATIONS

- Notebook Computers
- Digital Still Cameras
- PDAs
- Critical Microprocessor Monitoring

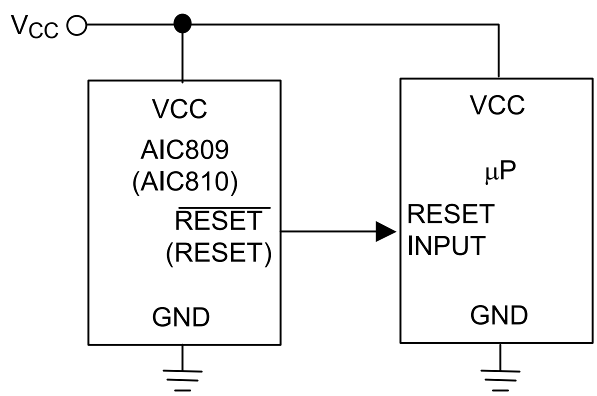
DESCRIPTION

AIC809/AIC810 are low-power microprocessor (μP) supervisory circuits used to monitor power supplies in μP and digital systems. They provide applications with benefits of circuit reliability and low cost by eliminating external components.

These devices perform as valid singles in applications with Vcc ranging from 6.0V down to 0.9V. The reset signal lasts for a minimum period of 140ms whenever VCC supply voltage falls below preset threshold. Both AIC809 and AIC810 were designed with a reset comparator to help identify invalid signals, which last less than 140ms. The only difference between them is that they have an active-low $\overline{\text{RESET}}$ output and active-high RESET output, respectively.

Low supply current (1μA) makes AIC809/AIC810 ideal for portable equipment. The devices are available in SOT-23 package.

TYPICAL APPLICATION CIRCUIT



Push-Pull Output

ORDERING INFORMATION

AIC809X-XXXXXX
AIC810 -XXXXXX

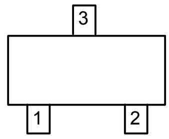
- PACKING TYPE
  TR: TAPE & REEL
  BG: BAG
- PACKAGE TYPE
  U: SOT-23
- C: COMMERCIAL
  P: LEAD FREE COMMERCIAL
- RESET THRESHOLD VOLTAGE
  23: 2.3V
  26: 2.6V
  29: 2.9V
  31: 3.1V
  40: 4.0V
  44: 4.4V
  46: 4.6V
- OUTPUT TYPE
  DEFAULT: Push-Pull type
  N: N-ch Open-Drain type

(Additional voltage versions with a unit of 0.1V within the voltage range from 1.5V to 5.5V for this product line may be available on demand with prior consultation with AIC.)

Example: AIC809-31-CUTR
→ 3.1V and push-pull version, in SOT-23 Package & Tape & Reel Packing Type
AIC809-31-PUTR
→ 3.1V and push-pull version, in Lead Free SOT-23 Package & Tape & Reel Packing Type

PIN CONFIGURATION

SOT-23
TOP VIEW
1: GND
2: $\overline{\text{RESET}}$ (RESET)
3: VCC



- **SOT-23 Marking**

Part No.	Marking	Part No.	Marking	Part No.	Marking
AIC809-23CU	RA23	AIC809N23CU	RB23	AIC810-23CU	RD23
AIC809-26CU	RA26	AIC809N26CU	RB26	AIC810-26CU	RD26
AIC809-29CU	RA29	AIC809N29CU	RB29	AIC810-29CU	RD29
AIC809-31CU	RA31	AIC809N31CU	RB31	AIC810-31CU	RD31
AIC809-40CU	RA40	AIC809N40CU	RB40	AIC810-40CU	RD40
AIC809-44CU	RA44	AIC809N44CU	RB44	AIC810-44CU	RD44
AIC809-46CU	RA46	AIC809N46CU	RB46	AIC810-46CU	RD46

Part No.	Marking
AIC809-23PU	RA23P
AIC809-26PU	RA26P
AIC809-29PU	RA29P
AIC809-31PU	RA31P
AIC809-40PU	RA40P
AIC809-44PU	RA44P
AIC809-46PU	RA46P

Part No.	Marking
AIC809N23PU	RB23P
AIC809N26PU	RB26P
AIC809N29PU	RB29P
AIC809N31PU	RB31P
AIC809N40PU	RB40P
AIC809N44PU	RB44P
AIC809N46PU	RB46P

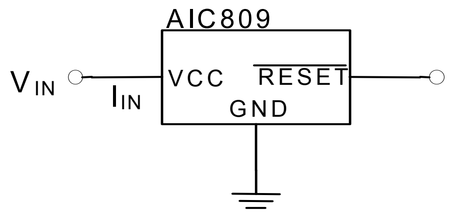
Part No.	Marking
AIC810-23PU	RD23P
AIC810-26PU	RD26P
AIC810-29PU	RD29P
AIC810-31PU	RD31P
AIC810-40PU	RD40P
AIC810-44PU	RD44P
AIC810-46PU	RD46P

■ ABSOLUTE MAXIMUM RATINGS

V_{CC} .... -0.3V ~6.5V
RESET, $\overline{RESET}$ .... -0.3V ~ (VCC+0.3V)
Input Current (V_{CC}) 20mA
Output Current (RESET or $\overline{RESET}$) 20mA
Continuous Power Dissipation (T_A = +70°C) 320mW
Operating Junction Temperature Range .... -40°C ~ 85°C
Junction Temperature .... 125°C
Storage Temperature Range .... - 65°C ~ 150°C
Lead Temperature (Soldering) 10 sec .... 260°C

Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

■ TEST CIRCUIT



ELECTRICAL CHARACTERISTICS

(Typical values are at T_A=25°C, unless otherwise specified.) (Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Operating Voltage Range	V_{CC}			0.9		6	V
Supply Current	I_{CC}	$V_{CC} = V_{TH}$ +0.1V			1	3	μA
Reset Threshold	V_{TH}	AIC809-23	T_A=+25°C	2.265	2.3	2.335	V
			T_A= -40°C to +85°C	2.254		2.346	
		AIC809-26	T_A=+25°C	2.561	2.6	2.639	
			T_A= -40°C to +85°C	2.548		2.652	
		AIC809-29	T_A=+25°C	2.857	2.9	2.944	
			T_A= -40°C to +85°C	2.842		2.958	
		AIC809-31	T_A=+25°C	3.054	3.1	3.147	
			T_A= -40°C to +85°C	3.038		3.162	
		AIC809-40	T_A=+25°C	3.940	4.0	4.060	
			T_A= -40°C to +85°C	3.920		4.080	
		AIC809-44	T_A=+25°C	4.334	4.4	4.466	
			T_A= -40°C to +85°C	4.312		4.488	
		AIC809-46	T_A=+25°C	4.531	4.6	4.669	
			T_A=-40°C to +85°C	4.508		4.692	
V_{CC} to Reset Delay	T_{RD}	$V_{CC}=V_{TH}$ to (V_{TH} -0.1V), V_{TH}=3.1V			20		μS
Reset Active Timeout Period	T_{RP}	$V_{CC} = V_{TH\ (MAX)}$	T_A=+25°C	140	230	560	mS
			T_A= -40°C to +85°C	100		1030	
$\overline{RESET}$ Output Voltage	V_{OH}	$V_{CC}=V_{TH}$+0.1V, I_{SOURCE}=1mA		0.8V_{CC}			V
	V_{OL}	$V_{CC}=V_{TH}$ - 0.1V, I_{SINK}=1mA				0.2Vcc	
RESET Output Voltage	V_{OH}	$V_{CC}=V_{TH}$-0.1V, I_{SOURCE}=1mA		0.8V_{CC}			V
	V_{OL}	$V_{CC}=V_{TH}$+0.1V, I_{SINK}=1mA				0.2Vcc	

Note1: Specifications are production tested at T_A=25°C. Specifications over the -40°C to 85°C operating temperature range are assured by design, characterization and correlation with Statistical Quality Controls (SQC).

Note2: $\overline{RESET}$ output is for AIC809; RESET output is for AIC810.

TYPICAL PERFORMANCE CHARACTERISTICS

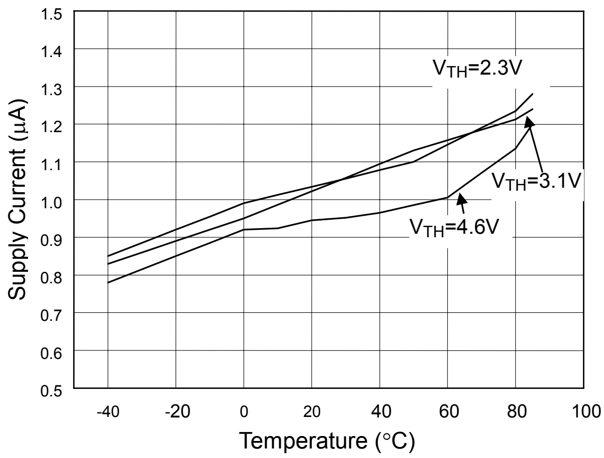


Fig 1 Supply Current vs. Temperature

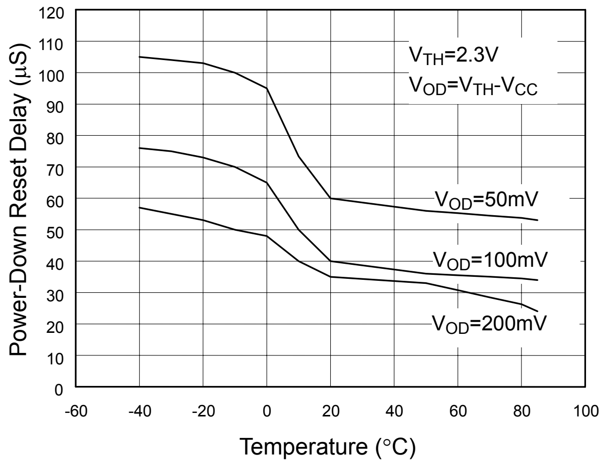


Fig 2 Power-Down Reset Delay vs. Temperature

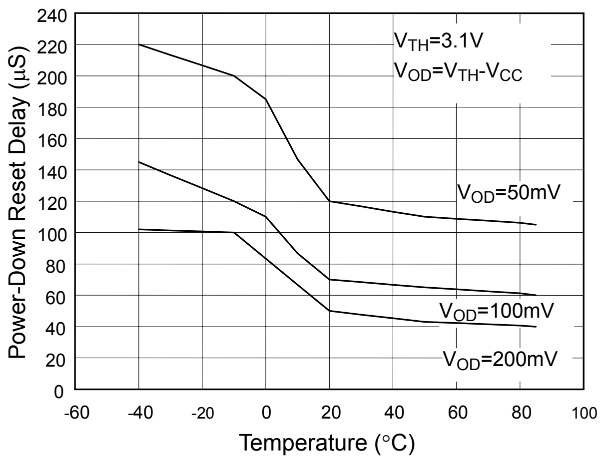


Fig 3 Power-Down Reset Delay vs. Temperature

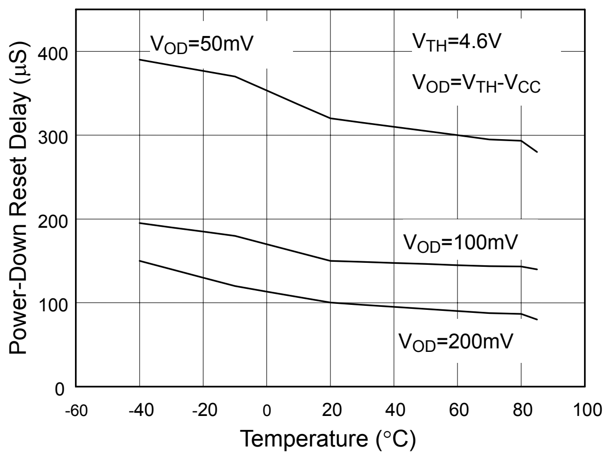


Fig 4 Power-Down Reset Delay vs. Temperature

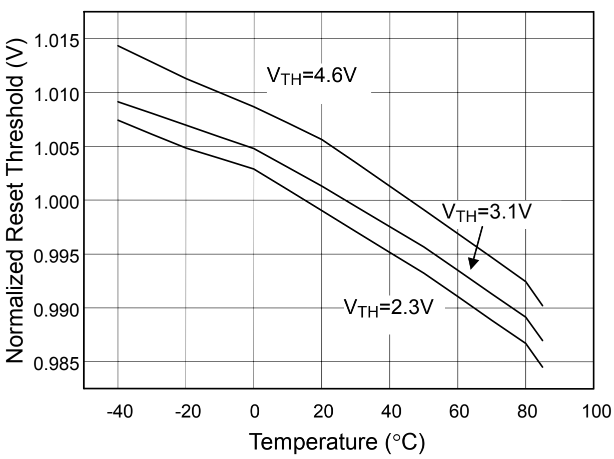


Fig 5 Normalized Reset Threshold vs. Temperature

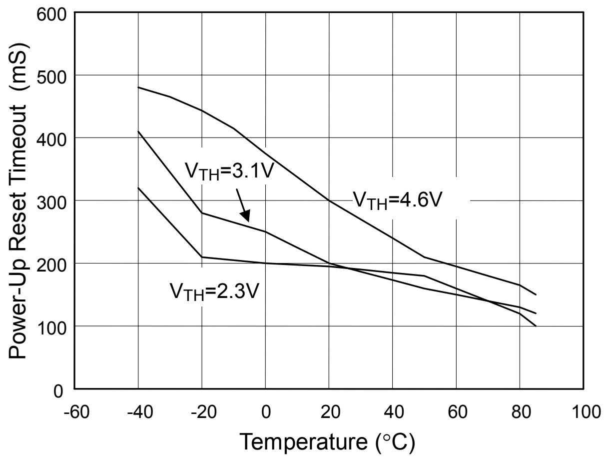
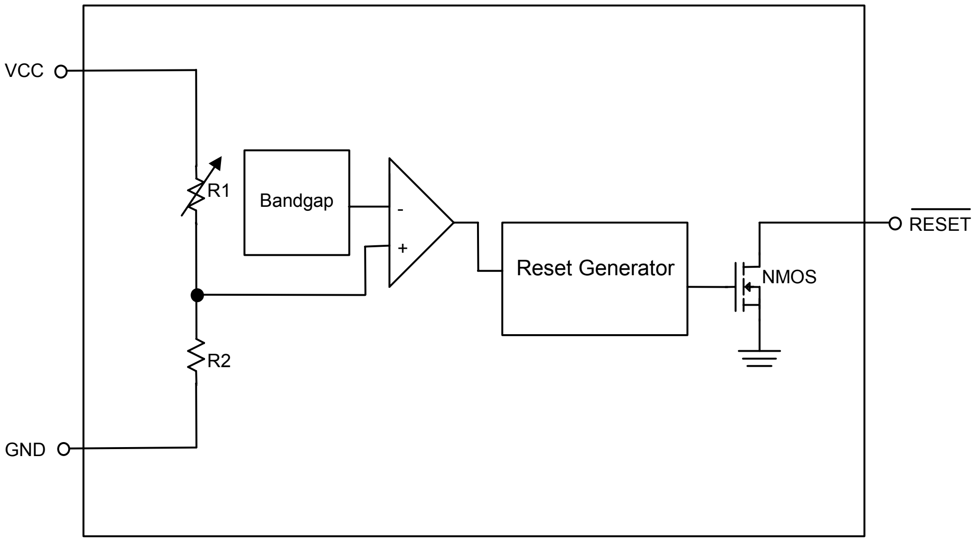
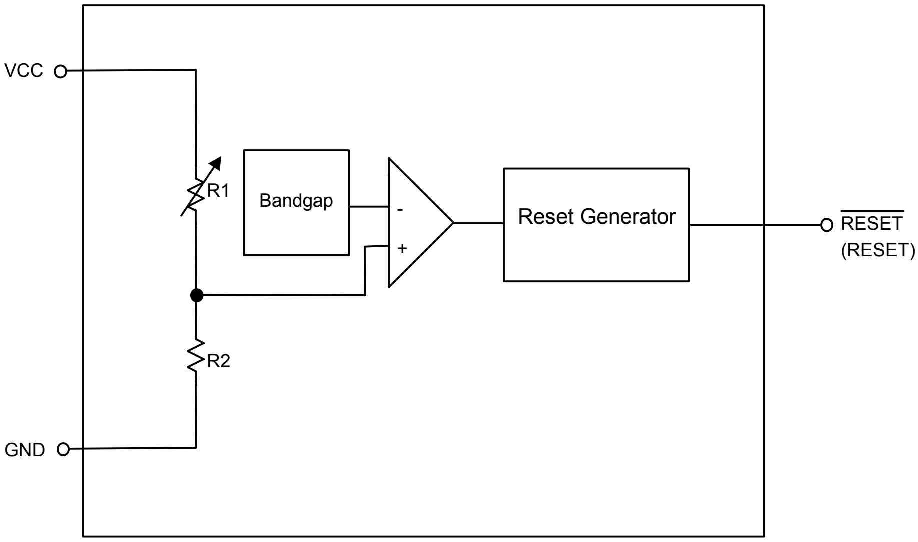


Fig 6 Power-Up Reset Timeout vs. Temperature

■ BLOCK DIAGRAMS



N-ch Open-Drain Type



Push-Pull Type

PIN DESCRIPTIONS

GND Pin : Ground.

$\overline{RESET}$ Pin (AIC809) : Active low output pin. $\overline{RESET}$ Output remains low while Vcc is below the reset threshold.

RESET Pin (AIC810) : Active high output pin. RESET output remains high while Vcc is below the reset threshold.

Vcc Pin : Supply voltage.

DETAIL DESCRIPTIONS OF TECHNICAL TERMS

RESET OUTPUT

μP will be activated at a valid reset state. These μP supervisory circuits assert reset to prevent code execution errors during power-up, power-down, or brownout conditions.

$\overline{RESET}$ is guaranteed to be a logic low for V_{TH}>VCC>0.9V. Once VCC exceeds the reset threshold, an internal timer keeps $\overline{RESET}$ low for the reset timeout period; after this interval, $\overline{RESET}$ goes high.

If a brownout condition occurs (VCC drops below the reset threshold), $\overline{RESET}$ goes low. Any time VCC goes below the reset threshold, the internal timer resets to zero, and $\overline{RESET}$ goes low. The internal timer is activated after VCC returns above the reset threshold, and $\overline{RESET}$ remains low for the reset timeout period.

BENEFITS OF HIGHLY ACCURATE RESET THRESHOLD

AIC809/810 with specified voltage as 5V±10% or 3V±10% are ideal for systems using a 5V±5% or 3V±5% power supply. The reset is guaranteed to assert after the power supply falls out of regulation, but before power drops below the minimum specified operating voltage range of the system ICs. The pre-trimmed thresholds are reducing the range over which an undesirable reset may occur.

APPLICATION INFORMATION

NEGATIVE-GOING VCC TRANSIENTS

In addition to issuing a reset to the μP during power-up, power-down, and brownout conditions, AIC809 series are relatively resistant to short-duration negative-going VCC transient.

ENSURING A VALID RESET OUTPUT DOWN TO VCC=0

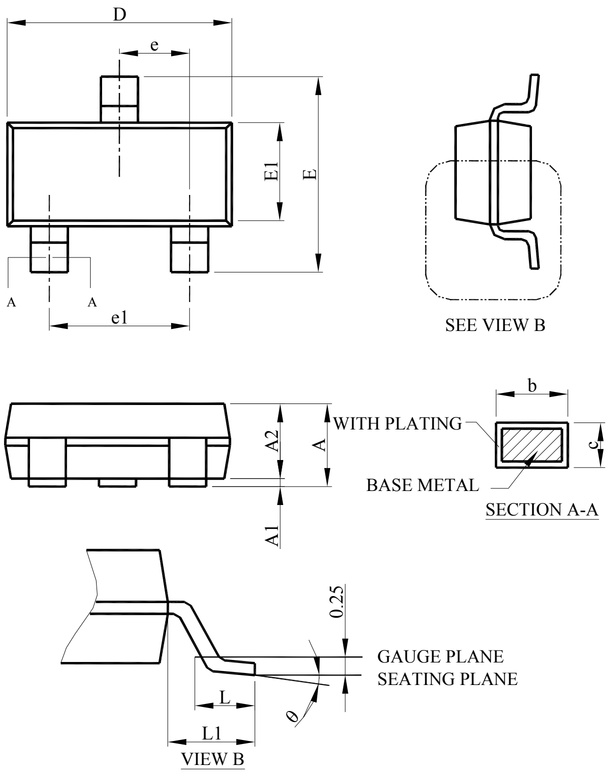
When VCC falls below 0.9V, AIC809 $\overline{RESET}$ output no longer sinks current; it becomes an open circuit. In this case, high-impedance CMOS logic inputs connecting to $\overline{RESET}$ can drift to undetermined voltages. Therefore, AIC809/810 with CMOS is perfect for most applications of VCC below 0.9V. However in applications where $\overline{RESET}$ must be valid down to 0V, adding a pull-down resistor to $\overline{RESET}$ causes any leakage currents to flow to ground, holding $\overline{RESET}$ low.

INTERFACING TO μP WITH BIDIRECTIONAL RESET PINS

The $\overline{RESET}$ output on the AIC809N is open drain, this device interfaces easily with μPs that have bidirectional reset pins. Connecting the μP supervisor's $\overline{RESET}$ output directly to the microcontroller's $\overline{RESET}$ pin with a single pull-up resistor allows either device to assert reset.

PHYSICAL DIMENSIONS (unit: mm)

- **SOT-23**



SYMBOL	SOT-23	
	MILLIMETERS	
	MIN.	MAX.
A	0.95	1.45
A1	0.05	0.15
A2	0.90	1.30
b	0.30	0.50
c	0.08	0.22
D	2.80	3.00
E	2.60	3.00
E1	1.50	1.70
e	0.95 BSC	
e1	1.90 BSC	
L	0.30	0.60
L1	0.60 REF	
θ	0°	8°

Note:

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